Class AB stereo headphone driver TDA1308

FEATURES

- Wide temperature range
- No switch ON/OFF clicks
- Excellent power supply ripple rejection
- Low power consumption
- Short-circuit resistant
- High performance
  - high signal-to-noise ratio
  - high slew rate
  - low distortion
- Large output voltage swing.

GENERAL DESCRIPTION

The TDA1308 is an integrated class AB stereo headphone driver contained in an SO8 or a DIP8 plastic package. The device is fabricated in a 1 mm CMOS process and has been primarily developed for portable digital audio applications.

QUICK REFERENCE DATA

V_{DD} = 5 V; V_{SS} = 0 V; T_{amb} = 25 °C; f_i = 1 kHz; R_L = 32 Ω; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{DD}	supply voltage					
	single		3.0	5.0	7.0	V
	dual		1.5	2.5	3.5	V
V_{SS}	negative supply voltage		–1.5	–2.5	–3.5	V
I_{DD}	supply current	no load	–	3	5	mA
P_{tot}	total power dissipation	no load	–	15	25	mW
P_o	maximum output power	THD < 0.1%; note 1	–	60	–	mW
(THD + N)/S	total harmonic distortion plus noise-to-signal ratio	note 1				
			–	0.03	0.06	%
			–	–70	–65	dB
		R_L = 5 kΩ	–	–101	–	dB
S/N	signal-to-noise ratio		100	110	–	dB
α_{cs}	channel separation		–	70	–	dB
		R_L = 5 kΩ	–	105	–	dB
PSRR	power supply ripple rejection	f_i = 100 Hz; $V_{ripple(p-p)}$ = 100 mV	–	90	–	dB
T_{amb}	operating ambient temperature		–40	–	+85	°C

Note

1. V_{DD} = 5 V; $V_{O(p-p)}$ = 3.5 V (at 0 dB).

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA1308	DIP8	plastic dual in-line package; 8 leads (300 mil)	SOT97-1
TDA1308T	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

BLOCK DIAGRAM

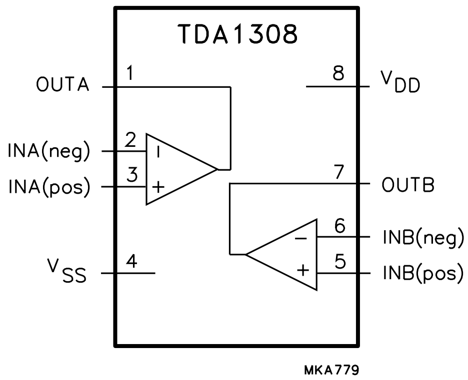


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
OUTA	1	output A
INA(neg)	2	inverting input A
INA(pos)	3	non-inverting input A
V_{SS}	4	negative supply
INB(pos)	5	non-inverting input B
INB(neg)	6	inverting input B
OUTB	7	output B
V_{DD}	8	positive supply

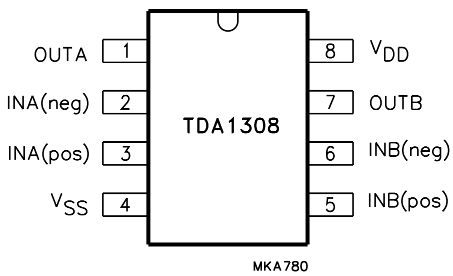


Fig.2 Pin configuration.

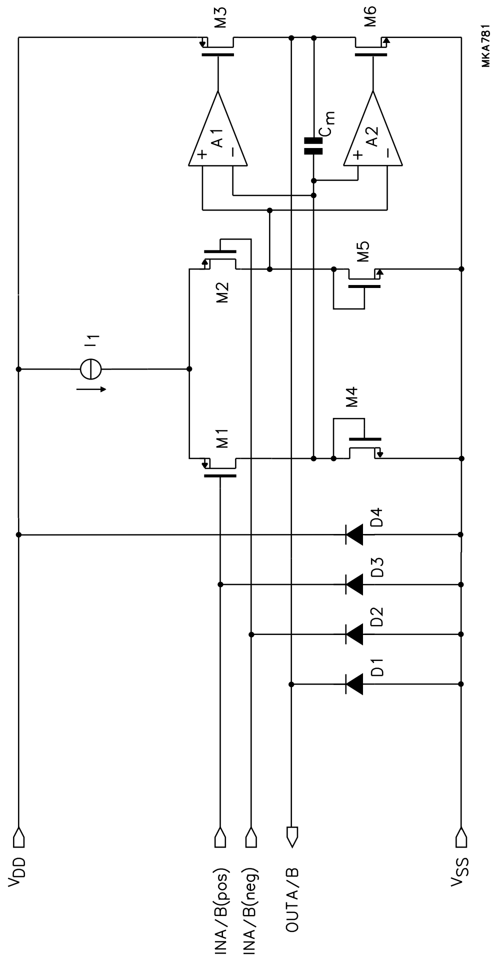


Fig.3 Equivalent schematic diagram.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DD}	supply voltage		0	8.0	V
$t_{SC(O)}$	output short-circuit duration	T_{amb} = 25 °C; P_{tot} = 1 W	20	–	s
T_{stg}	storage temperature		–65	+150	°C
T_{amb}	operating ambient temperature		–40	+85	°C
V_{esd}	electrostatic discharge	note 1	–2000	+2000	V
		note 2	–200	+200	V

Notes

1. Human body model: C = 100 pF; R = 1500 Ω; 3 pulses positive plus 3 pulses negative.
2. Machine model: C = 200 pF: L = 0.5 mH: R = 0 Ω; 3 pulses positive plus 3 pulses negative.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air		
	DIP8	109	K/W
	SO8	210	K/W

QUALITY SPECIFICATION

In accordance with *“UZW-BO/FQ-0601”*. The numbers of the quality specification can be found in the *“Quality Reference Handbook”*. The handbook can be ordered using the code 9398 510 63011.

CHARACTERISTICS

V_{DD} = 5 V; V_{SS} = 0 V; T_{amb} = 25 °C; f_i = 1 kHz; R_L = 32 Ω; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supplies						
V_{DD}	supply voltage					
	single		3.0	5.0	7.0	V
	dual		1.5	2.5	3.5	V
V_{SS}	negative supply voltage		–1.5	–2.5	–3.5	V
I_{DD}	supply current	no load	–	3	5	mA
P_{tot}	total power dissipation	no load	–	15	25	mW
DC characteristics						
$V_{I(os)}$	input offset voltage		–	10	–	mV
I_{bias}	input bias current		–	10	–	pA
V_{CM}	common mode voltage		0	–	3.5	V
G_v	open-loop voltage gain	R_L = 5 kΩ	–	70	–	dB
I_O	maximum output current	(THD + N)/S < 0.1%	–	60	–	mA
R_O	output resistance		–	0.25	–	Ω
V_O	output voltage swing	note 1	0.75	–	4.25	V
		R_L = 16 Ω; note 1	1.5	–	3.5	V
		R_L = 5 kΩ; note 1	0.1	–	4.9	V
PSRR	power supply rejection ratio	f_i = 100 Hz; $V_{ripple(p-p)}$ = 100 mV	–	90	–	dB
α_{cs}	channel separation		–	70	–	dB
		R_L = 5 kΩ	–	105	–	dB
C_L	load capacitance		–	–	200	pF
AC characteristics						
(THD + N)/S	total harmonic distortion plus noise-to-signal ratio	note 2	–	–70	–65	dB
			–	0.03	0.06	%
		note 2; R_L = 5 kΩ	–	–101	–	dB
			–	0.0009	–	%
S/N	signal-to-noise ratio		100	110	–	dB
f_G	unity gain frequency	open-loop; R_L = 5 kΩ	–	5.5	–	MHz
P_o	maximum output power	(THD + N)/S < 0.1%	–	60	–	mW
C_i	input capacitance		–	3	–	pF
SR	slew rate	unity gain inverting	–	5	–	V/µs
B	power bandwidth	unity gain inverting	–	20	–	kHz

Notes

1. Values are proportional to V_{DD}; (THD + N)/S < 0.1%.
2. V_{DD} = 5.0 V; $V_{O(p-p)}$ = 3.5 V (at 0 dB).

TEST AND APPLICATION INFORMATION

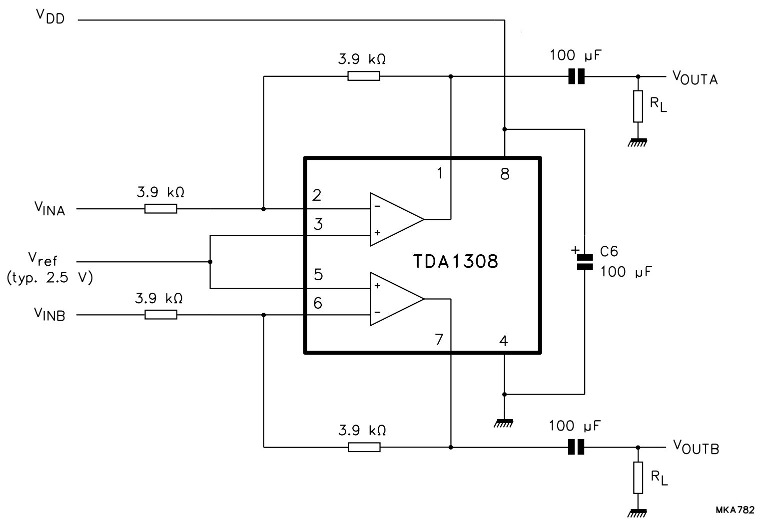


Fig.4 Measurement circuit for inverting application.

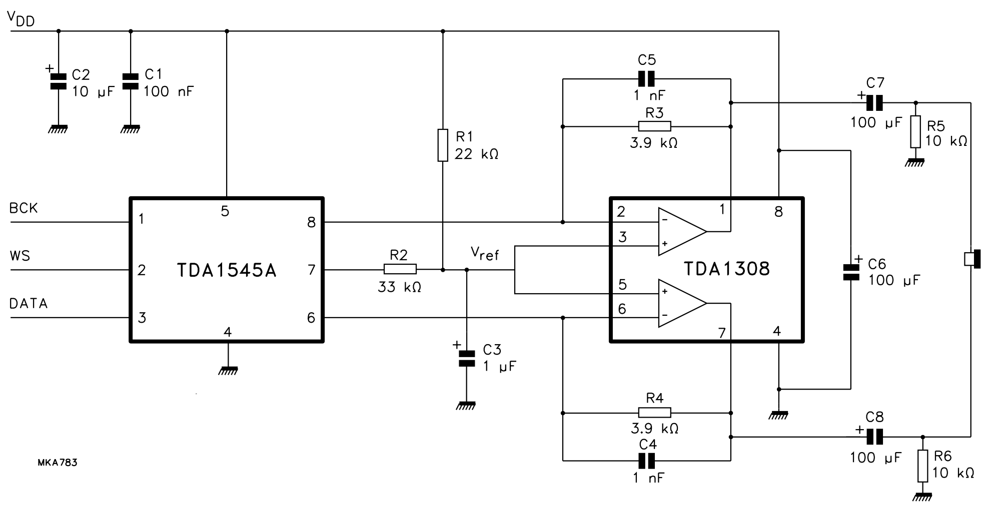


Fig.5 Example of application with TDA1545A (stereo continuous calibration DAC).

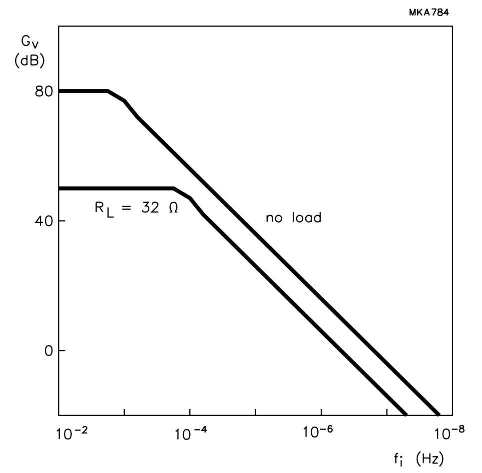


Fig.6 Open-loop gain as a function of input frequency.

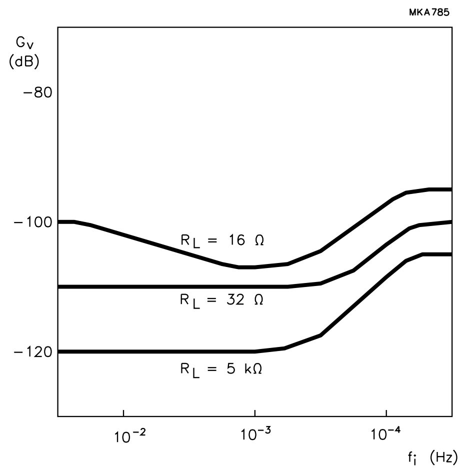


Fig.7 Crosstalk as a function of input frequency.

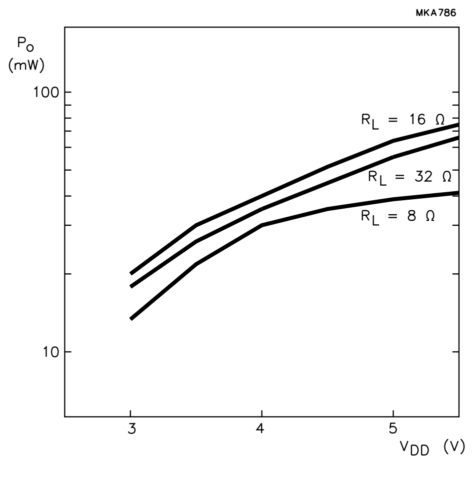


Fig.8 Output power as a function of supply voltage.

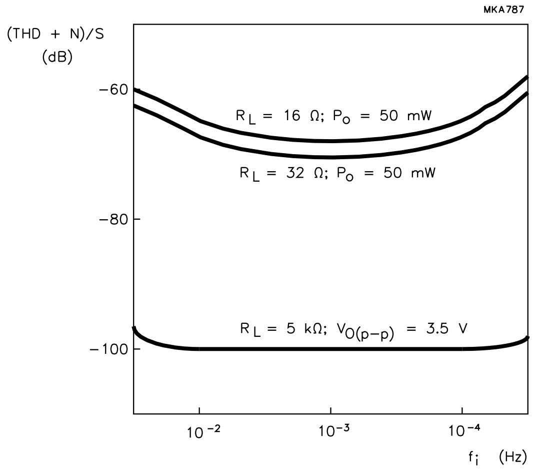


Fig.9 Total harmonic distortion plus noise-to-signal ratio as a function of input frequency.

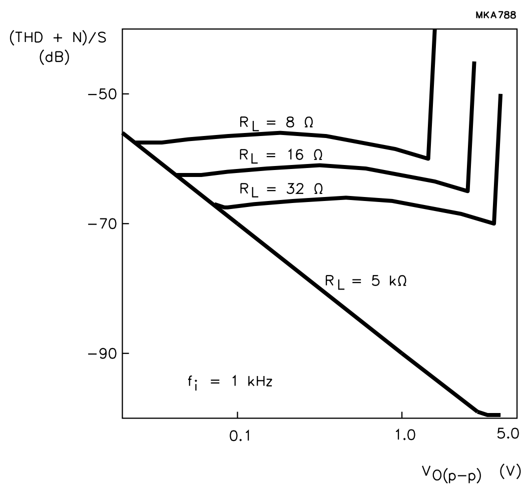
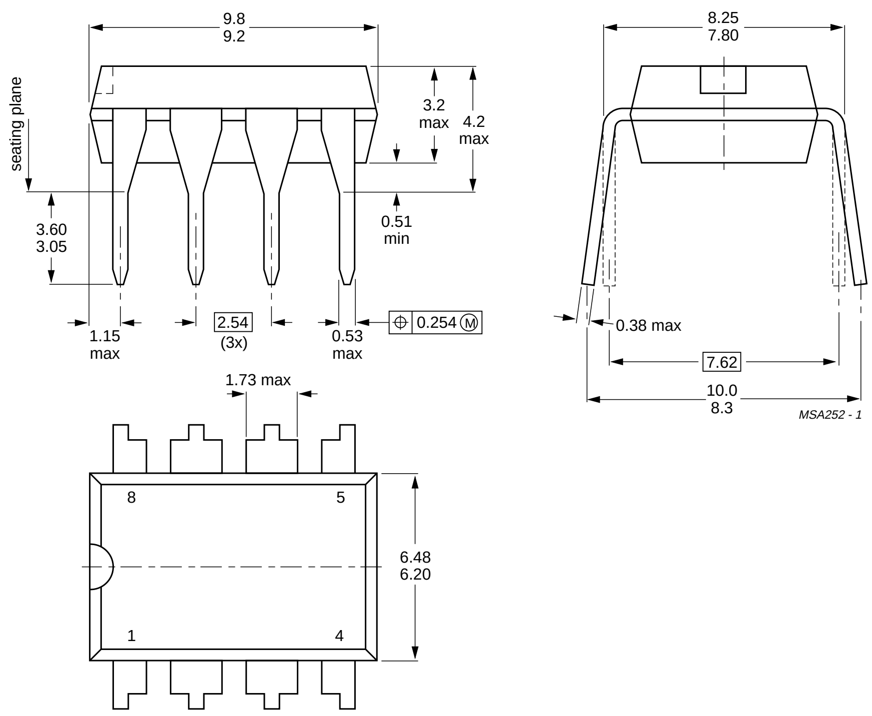


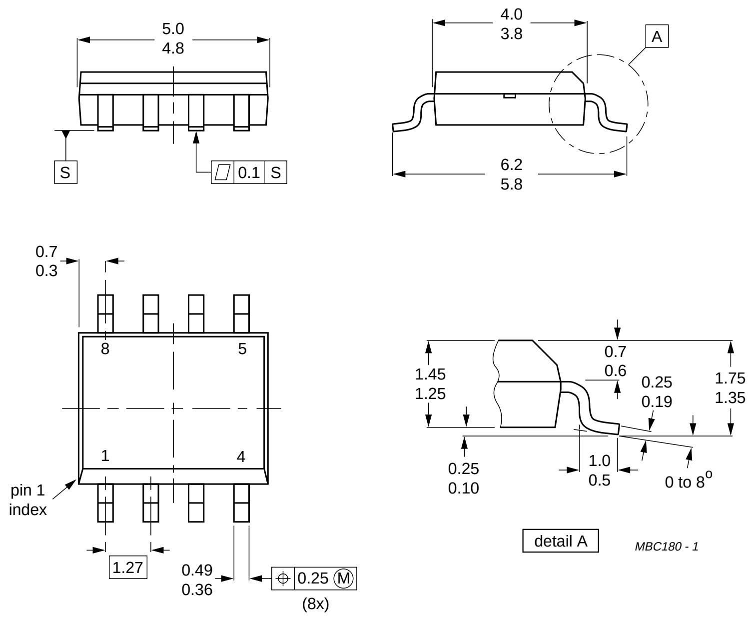
Fig.10 Total harmonic distortion plus noise-to-signal ratio as a function of output voltage level.

PACKAGE OUTLINES



Dimensions in mm.

Fig.11 Plastic dual in-line package; 8 leads (300 mil); DIP8; SOT97-1.



Dimensions in mm.

Fig.12 Plastic small outline package; 8 leads; body width 3.9 mm. (SO8; SOT96-1).

SOLDERING

Plastic dual in-line packages

BY DIP OR WAVE

The maximum permissible temperature of the solder is 260 °C; this temperature must not be in contact with the joint for more than 5 s. The total contact time of successive solder waves must not exceed 5 s.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified storage maximum. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

REPAIRING SOLDERED JOINTS

Apply the soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C, it must not be in contact for more than 10 s; if between 300 and 400 °C, for not more than 5 s.

Plastic small outline packages

BY WAVE

During placement and before soldering, the component must be fixed with a droplet of adhesive. After curing the adhesive, the component can be soldered. The adhesive can be applied by screen printing, pin transfer or syringe dispensing.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder bath is 10 s, if allowed to cool to less than 150 °C within 6 s. Typical dwell time is 4 s at 250 °C.

A modified wave soldering technique is recommended using two solder waves (dual-wave), in which a turbulent wave with high upward pressure is followed by a smooth laminar wave. Using a mildly-activated flux eliminates the need for removal of corrosive residues in most applications.

BY SOLDER PASTE REFLOW

Reflow soldering requires the solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the substrate by screen printing, stencilling or pressure-syringe dispensing before device placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt, infrared, and vapour-phase reflow. Dwell times vary between 50 and 300 s according to method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 min at 45 °C.

REPAIRING SOLDERED JOINTS (BY HAND-HELD SOLDERING IRON OR PULSE-HEATED SOLDER TOOL)

Fix the component by first soldering two, diagonally opposite, end pins. Apply the heating tool to the flat part of the pin only. Contact time must be limited to 10 s at up to 300 °C. When using proper tools, all other pins can be soldered in one operation within 2 to 5 s at between 270 and 320 °C. (Pulse-heated soldering is not recommended for SO packages.)

For pulse-heated solder tool (resistance) soldering of VSO packages, solder is applied to the substrate by dipping or by an extra thick tin/lead plating before package placement.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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